



# Seizing the Light

By ERLA ZWINGLE



FIRST KODAK CAMERA, 1888

"I HAVE SEIZED the light—I have arrested its flight!" cried Louis-Jacques-Mandé Daguerre upon producing the first daguerreotype, a small silver-coated copper plate on which he and his camera had captured and fixed a faithful image from life. Nobody knows what that image was, but the world would soon understand what it meant: After centuries of philosophical speculation, mechanical tinkering, optical refinement, and chemical experi-

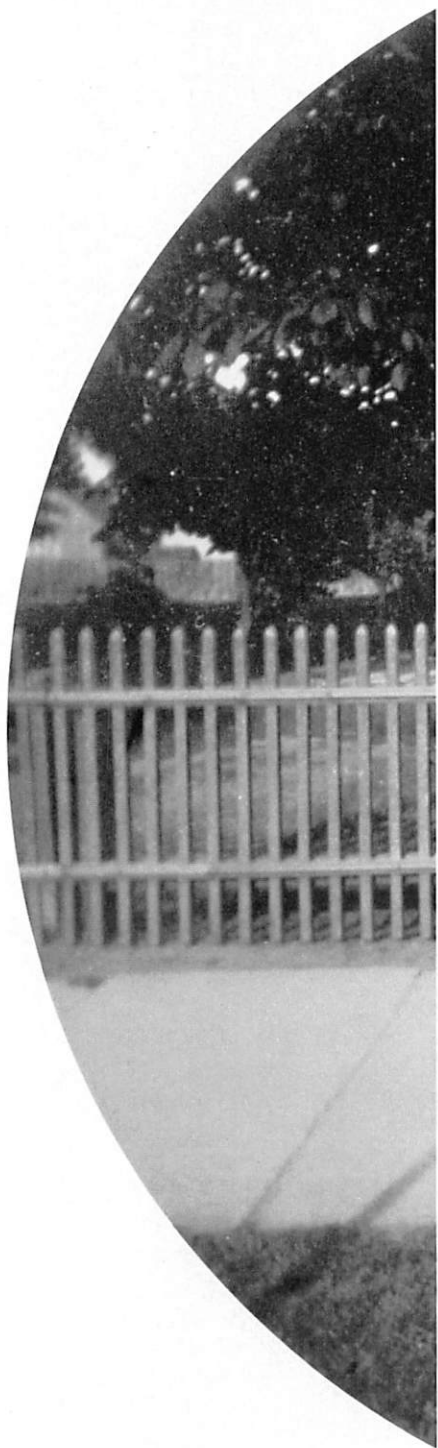
mentation, Daguerre had slipped the last piece of the puzzle into place and inaugurated the age of photography.

This year marks the 150th anniversary of that inauguration. But it was the first 50 years that saw the greatest evolution. During that period virtually every theme we still value in photography was embarked upon in a ferment of experimentation—landscapes, documentaries, portraits, polemics, fantasies. Form grappled with content, mind struggled to surmount matter.

Though most refinements of the early processes were discovered by amateurs (some experiments went nowhere, of course; the use of flower extracts as a light-sensitive agent, for example, never caught on), photography almost instantly became a business. "Into the practice of no other business or art was there ever such an absurd, blind, and pell-mell rush," said one of America's foremost daguerreotypists, Albert Sands Southworth.

Technical improvements were so rapid that histories of the period tend to focus on their domino-like progression. Exposure times shortened dramatically, image size grew and shrank, the advent of the

ERLA ZWINGLE has written extensively about photography and photographers. She is a frequent contributor to NATIONAL GEOGRAPHIC.





TOPKNOT FISH, *NOTOCLINUS FENESTRATUS*





PHOTOGRAPHER  
UNKNOWN

*Catching an instant in time, a Kodak snapshot illustrates the rapid evolution of photography. During its first 50 years, the young art grew from an aristocratic curiosity to a democratic memory maker.*

UNTITLED, CA 1889; INTERNATIONAL  
MUSEUM OF PHOTOGRAPHY AT GEORGE EASTMAN  
HOUSE, ROCHESTER, NEW YORK, GIFT OF  
GEORGE B. DRYDEN



FULL-PLATE  
DAGUERRETYPE CAMERA, 1840

collodion wet plate in 1851 resulted in a high-quality negative capable of producing numerous prints,\* and the gelatin dry plate in 1871 (which led to shortened exposure times, allowing cameras to be hand held) ultimately made the snapshot possible, enabling everyone to be a photographer.

Yet fascinating as the mechanics and chemistry may be, we cannot enter into the spirit of the age if we regard photography's evolution primarily in these terms. Photography's advent was a triumph of imagination as much as of science, and the individuals who took part in it—regardless of which side of the lens they were on—were excited. Astonished. Overwhelmed.

"My dearest Miss Mitford," wrote Elizabeth Barrett Browning, "do you know anything about that wonderful invention of the day, called the Daguerrotype? . . . Think of a man sitting down in the sun and leaving his facsimile in all its full completion of outline and shadow, stedfast on a plate, at the end of a minute and a half! . . . the fact of the very shadow of the person lying there fixed for ever! . . . I would rather have such a memorial of one I dearly loved, than the noblest Artist's work ever produced."

But photography's exactitude could be risky. "Princess Caroline," wrote Danish novelist Isak Dinesen, ". . . had had her portrait painted many times in her life—but when she was given the first daguerreotype of herself, she looked at it silently for a long time and said, 'Well, I am very thankful my friends have stood by me.'"

THE CENTURIES OF THOUGHT that led to the invention of photography had been concerned as much with philosophy as with machinery: the essence of matter, the connection between thoughts and things, the reality of reality. Democritus of Abdera, for instance, had theorized that "the surfaces of all objects are continually throwing off 'images' . . . films or husks which float about in space and at last penetrate to the mind through the pores of the body" (hence "imagination"). By 1859, when the photograph had already captured a multitude of images, Oliver Wendell Holmes could write: "Every conceivable object of Nature and Art will soon scale off its surface for us."

At first the camera was perceived as a tool for the painter—a new way of recording reality before transforming it into art. Critics argued endlessly about what to criticize: photography was too accurate, not accurate enough, too much like painting, not at all like painting. Many feared that painter Paul Delaroche was prophetic in proclaiming, "From today, painting is dead."

The poet of decadence Charles Baudelaire, though frequently

\*Use of the wet-plate process in the pioneer West was described in "The Life and Times of William Henry Jackson," by Rowe Findley, in the February 1989 issue.

## HIPPOLYTE BAYARD

*Ghostly images of Parisian windmills were captured in a direct positive print, a process invented by Hippolyte Bayard. His discovery went unrecognized in the excitement created by Talbot and Daguerre.*

"MONTMARTRE, WINDMILLS," 1839;  
GILMAN PAPER COMPANY COLLECTION,  
NEW YORK CITY

## LOUIS-JACQUES- MANDÉ DAGUERRE

*Evoking the splendor of the Tuileries (below right), Daguerre first demonstrated his new image-making process for the public at the Hotel d'Orsay. Legend holds that he stumbled upon the process after storing an experimental copper plate among several chemicals. The next day, mercury vapors had developed the image on the plate.*

"PREMIÈRE ÉPREUVE FAITE PAR DAGUERRE DEVANT  
SES COLLÈGUES DE LA SOCIÉTÉ LIBRE DES  
BEAUX-ARTS," 1839; © MUSÉE NATIONAL DES  
TECHNIQUES, CNAM, PARIS

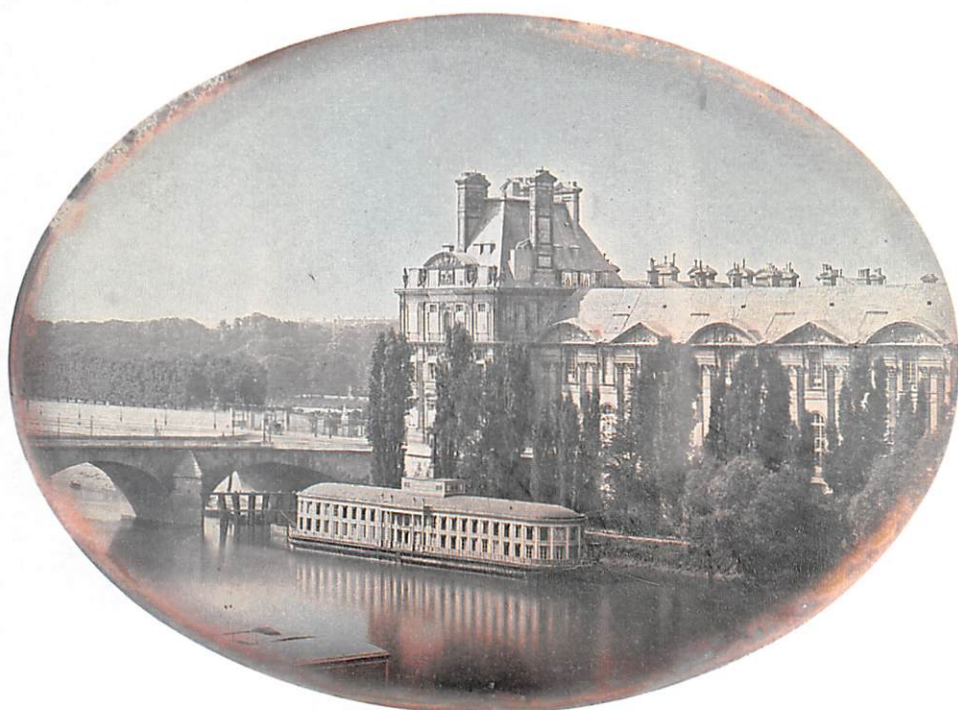


## WILLIAM HENRY FOX TALBOT

*Among the images fashioned by Talbot's invention of "photogenic drawing," a fragile swatch of lace (above) was captured on paper using silver chloride and sunlight.*

"LACE," CA 1844;  
NATIONAL MUSEUM OF SCIENCE AND  
INDUSTRY, LONDON, FOX TALBOT COLLECTION







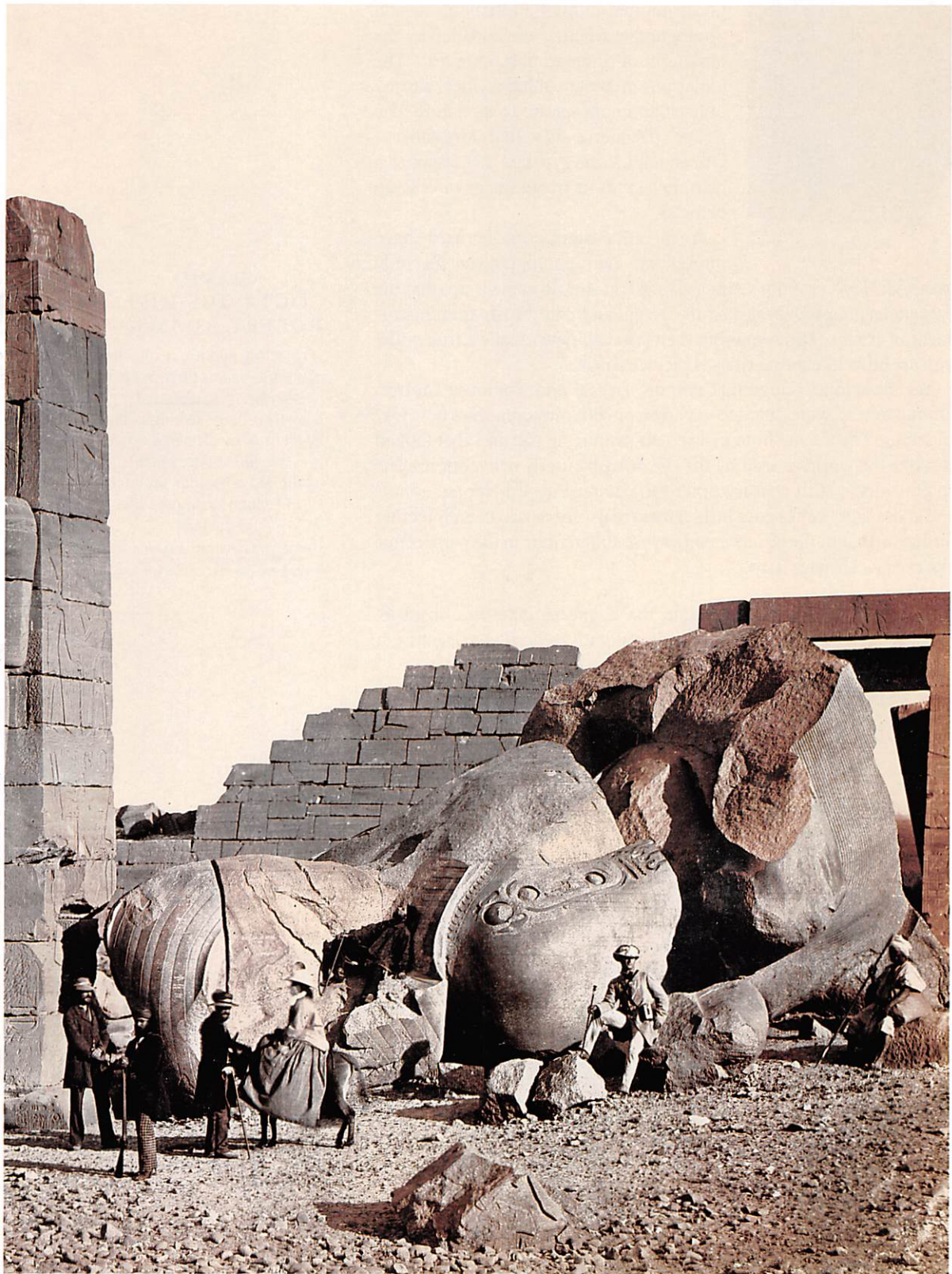
## FRANCIS FRITH

Cumbersome collodion wet plates, destined to be the standard process in photography over the next quarter century, were used by Francis Frith at mid-century to capture magnificent historical sites in Egypt and elsewhere in the Middle East. Selling individual albumen prints to travelers, archaeologists, and collectors—as well as supplying prints for two different editions of the Bible—Frith established himself as one of Britain's first great photographic publishers.

"FALLEN COLOSSUS,"  
CA 1858; JANET LEHR, INC., NEW YORK











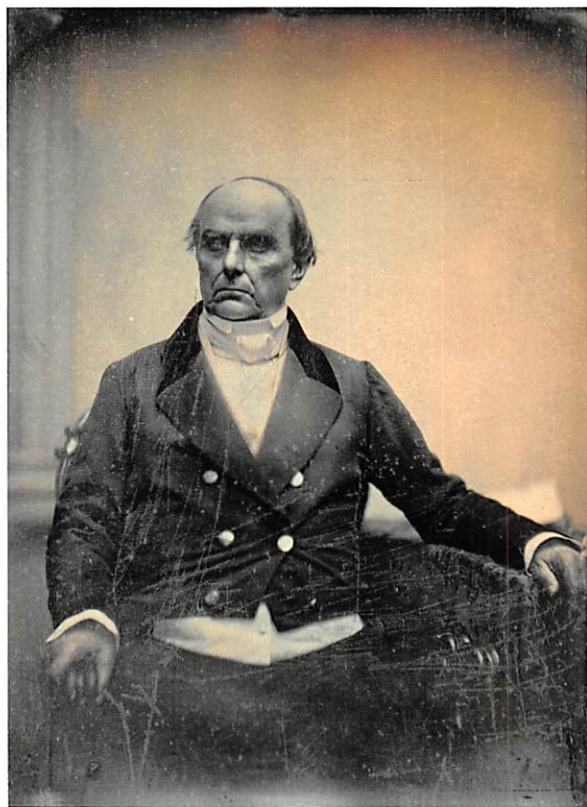
FOUR-LENS  
WET-PLATE CAMERA, CA 1860

photographed himself and having several photographer friends, was appalled by the onslaught of photography upon art: "The idolatrous mob demanded an ideal worthy of itself and appropriate to its nature," he wrote. "Daguerre was [its] Messiah. . . . Our squalid society rushed, Narcissus to a man, to gaze at its trivial image on a scrap of metal."

A generation later George Bernard Shaw, himself an avid photographer, gleefully asserted, "If you cannot see at a glance that the old game is up, that the camera has hopelessly beaten the pencil and paintbrush as an instrument of artistic representation, then you will never make a true critic: you are only, like most critics, a picture fancier."

Yet Delacroix, Gauguin, Cézanne, Degas, and Toulouse-Lautrec, among others, were quick to experiment with photography's new way of seeing. For the medium insisted on producing pictures that looked not like the world as seen by the eye or by painterly conventions. The hyperrealistic 20th-century American painter Edward Hopper admitted in despair: "I once got a little camera to use for details of architecture and so forth, but the photo was always so different from the perspective the eye gives, I gave it up."

WITHIN 20 years of its invention, the daguerreotype was obsolete. Because each image was unique and could not be used as a negative, it



## DAVID OCTAVIUS HILL, ROBERT ADAMSON

*Projecting apathy, suspicion, and amusement, three Scottish fishermen (right) posed for a portrait in the fishing village of Newhaven. One in a series, this salted paper print followed a popular practice of romanticizing the life of the poor.*

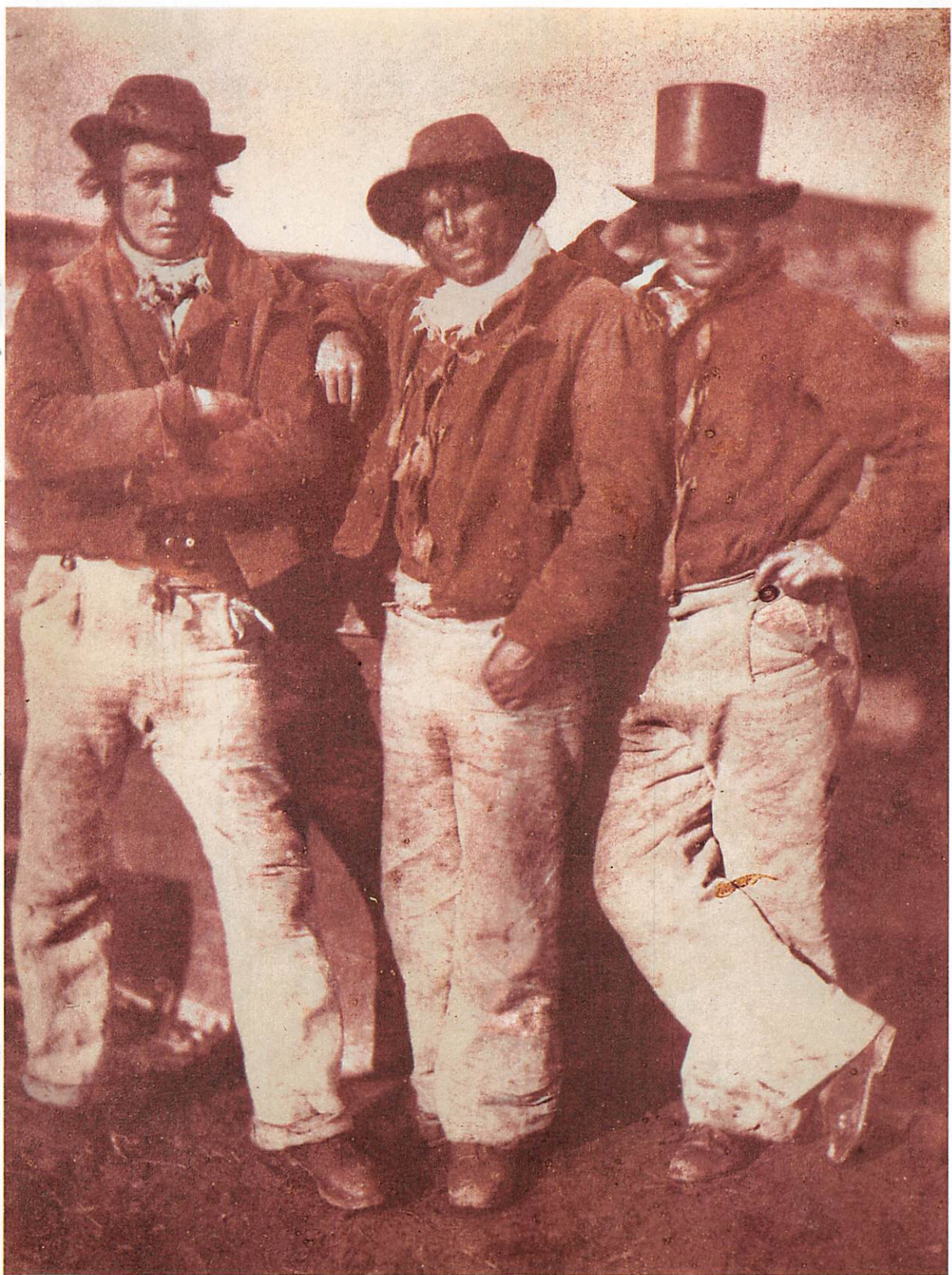
"ALEXANDER RUTHERFORD, WILLIAM RAMSAY, AND JOHN LISTON," CA 1845;  
ROYAL PHOTOGRAPHIC SOCIETY, BATH, ENGLAND

## ALBERT SANDS SOUTHWORTH, JOSIAH JOHNSON HAWES

*Setting themselves apart from their peers, Southworth and Hawes delved into the inner characters of their subjects. Bright skylights exaggerate Daniel Webster's imposing figure by darkening his eye sockets, dramatizing the overall daguerreotype image. A hidden neck brace held his head in place for the portrait, which required an exposure of 10 to 15 seconds.*

"DANIEL WEBSTER," 1851;  
THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY, GIFT OF I. N. PHELPS STOKES,  
EDWARD S. HAWES, ALICE MARY HAWES,  
MARION AUGUSTA HAWES, 1937

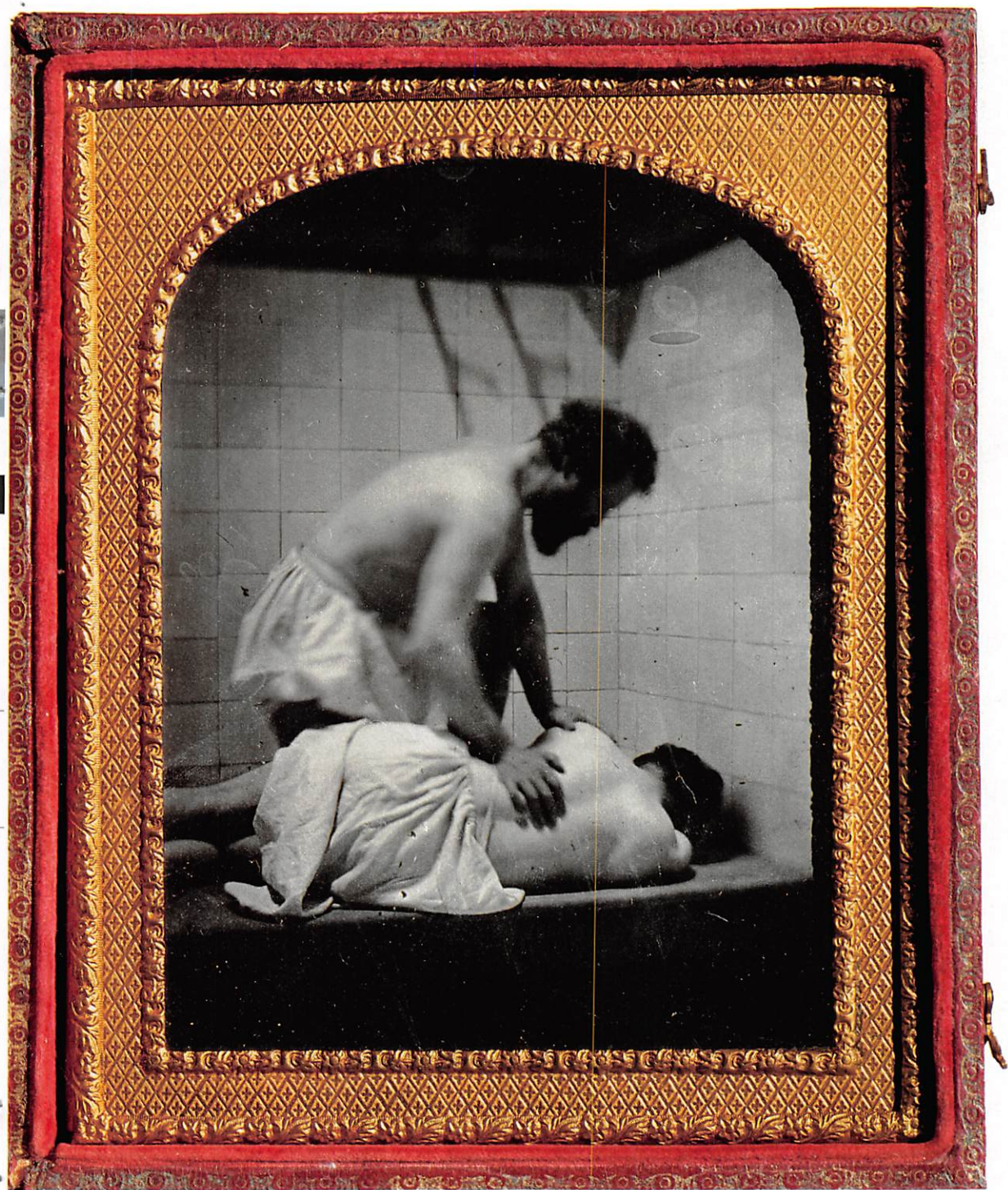












### ROBERT CRAWSHAY

Fearing that photographers would not easily accept the paper prints of the new collodion process after years of viewing daguerreotypes, Frederick Scott Archer conceived the ambrotype—a transitional process that made a unique positive image on glass. Robert Crawshaw, a well-known amateur in England, used the process to create this positive, silvery white image backed with black paint.

"STUDY IN A TURKISH BATH," CA 1870;  
COURTESY BOARD OF TRUSTEES OF THE VICTORIA AND ALBERT MUSEUM, LONDON







## JULIA MARGARET CAMERON

*The inspiration for Lewis Carroll's Alice's Adventures in Wonderland, Alice Liddell appears as a Roman goddess in this portrait by Julia Margaret Cameron, among the more innovative photographers of the 19th century. Valuing aesthetic qualities over descriptive ones, she photographed personal friends such as Robert Browning, Charles Darwin, Henry Wadsworth Longfellow, and Alfred, Lord Tennyson. One of the first to believe that photography could be an art, Cameron frequently placed her subjects in classical settings.*

"POMONA," 1872;  
ROYAL PHOTOGRAPHIC SOCIETY

## CLEMENTINA, VISCOUNTESS HAWARDEN

*In contrast to Cameron's forthright portraits, Hawarden's photographs—here of her daughters in London—possess a subtle strength. A member of the aristocracy, she pursued her hobby at a time when it was socially unacceptable for a woman of her class to dabble in such activities. To produce her albumen prints, she was forced to handle chemicals that emitted foul odors. Silver nitrate, which burns the skin and turns it black, could only be removed by washing with harsh chemicals.*

"A STUDY FROM LIFE," CA 1863;  
COURTESY BOARD OF TRUSTEES OF THE  
VICTORIA AND ALBERT MUSEUM

was superseded by other processes, some of which had been the object of inquiry by Daguerre's peers: Joseph-Nicéphore Niepce, for instance, who in 1824 had used a camera to produce the world's first photograph on a lithographic stone; Hippolyte Bayard, who in 1839 was the first to make a positive image on paper with a camera; and the Englishman William Henry Fox Talbot, whose positive-negative processes were the forerunners of the system we use today. In 1851 Frederick Scott Archer made a great technical leap with his collodion process, which produced on a glass plate a negative as sharp as a daguerreotype that was capable of yielding innumerable positive prints.

Nevertheless, the daguerreotypists left an extraordinary portrait gallery of a generation and a rich record of experiment that went far beyond the familiar studio portrait: photographs of the moon through a telescope, the hand of a Florida sea captain branded "SS" for slave stealer, candid shots grabbed in the street. The daguerreotypists' legacy abundantly demonstrates the basic artistic truth that the photograph is made by the photographer, not by the camera.

Photographers certainly behaved like artists from the start. "Max's days are entirely absorbed and consumed by photography," wrote Gustave Flaubert from Egypt to his mother concerning his companion Maxime Du Camp. "He is doing well, but grows desperate whenever he spoils a picture or finds that a plate has been badly washed. Really, if he doesn't take things easier he'll crack up."

Eadweard Muybridge, photographing the California wilderness, "waited several days in a neighborhood to get the proper conditions of atmosphere for some of his views . . . cut down trees by the score that interfered with the cameras . . . had himself lowered by ropes down







Capt. Russell, Pa.





ANDREW  
JOSEPH RUSSELL

*Their muskets at rest, dead  
Confederate soldiers fill end-  
less trenches at*

*Fredericksburg, Virginia. An-  
drew Joseph Russell, who pho-  
tographed railroad*

*construction during the Civil*

*War, also made battlefield*

*photographs for his command-*

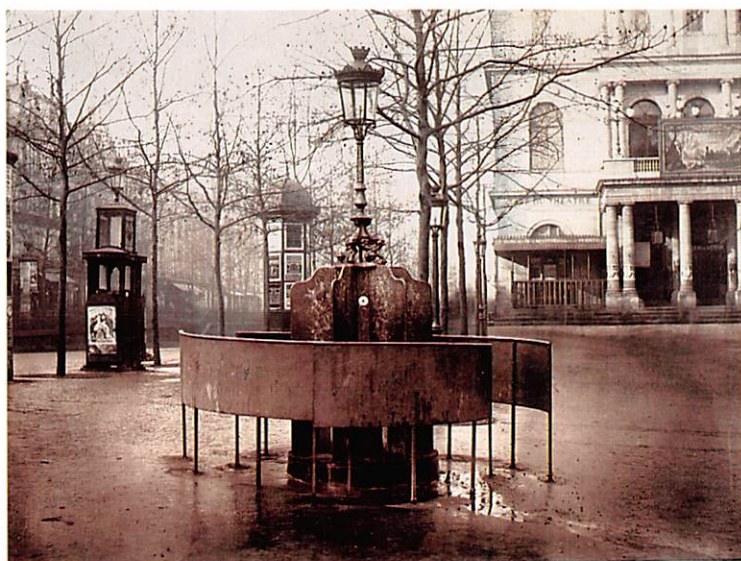
*ing general. In composing this*

*picture, he emphasized the*

*converging lines of rock wall  
and fallen soldiers.*

"STONE WALL, REAR OF FREDERICKSBURG,  
WITH REBEL DEAD," MAY 3, 1863;  
LIBRARY OF CONGRESS





## CHARLES MARVILLE

*Finding elegance in utility, Charles Marville transformed a urinal into a thing of beauty. Commissioned to document Paris streetlights and public urinals during municipal improvements, he pioneered the art of civic photography.*

"NO. 3, URINOIR (SYSTÈME JENNINGS), PLATEAU DE L'AMBIGU," 1865-1875;  
PHOTOTHÈQUE DES MUSÉES DE LA VILLE DE PARIS, COLLECTION MUSÉE CARNAVALET

precipices . . . [went] to points where his packers refused to follow."

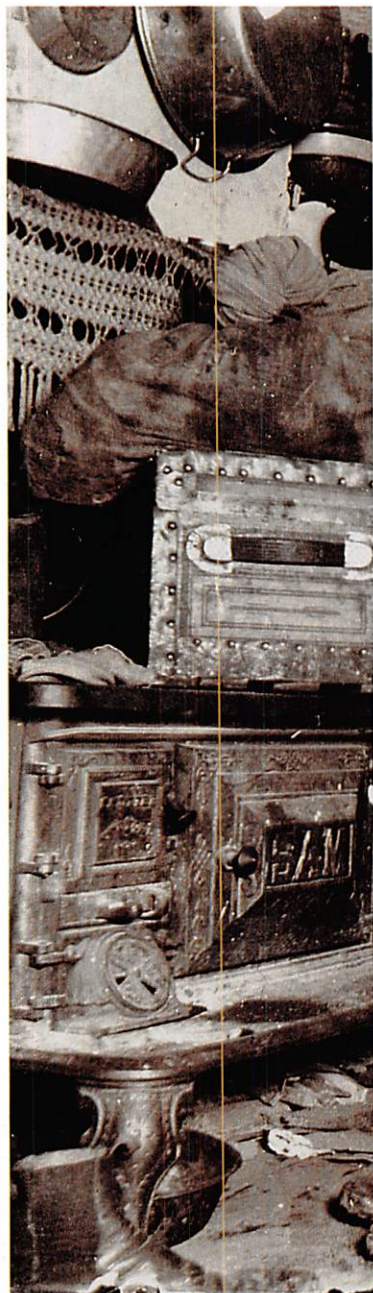
Felice Beato, one of the first war photographers, shocked an army surgeon in one of China's Opium Wars who wrote, "Signor Beato was here in great excitement, characterising the group [of corpses] as 'beautiful,' and begging that it might not be interfered with until perpetuated by his photographic apparatus. . . ." Even domestic confusion was inevitable. The great portraitist Julia Margaret Cameron, who worked in her backyard, reminisced that her "habit of running into the dining room with my wet pictures has stained such an immense quantity of table linen with nitrate of silver, indelible stains, that I should have been banished from any less indulgent household."

IT WAS WHEN PHOTOGRAPHS could be easily reproduced (both by unskilled factory-system workers making copies and then in newspapers and books) that photography began to exert its remarkable force on our view of the world. Its potential as propaganda had been shown beginning with the Civil War. Abraham Lincoln, frequently photographed by Mathew B. Brady and acutely sensitive to the uses of publicity, uttered the famous remark, "Brady and the Cooper Institute [where Lincoln gave a crucial speech] made me President."

So far had photography entered our common experience by the last decade of the 19th century that Stephen Crane could write in *The Red Badge of Courage*: "His mind took a mechanical but firm impression, so that afterward everything was pictured and explained to him, save why he himself was there."



DRY-PLATE FIELD CAMERA, PERKEN AND SON LTD., LONDON, CA 1890







JACOB A. RIIS (?)

Moved to make a statement about the squalor of New York City slums, police reporter Jacob Riis added photographic documentation to the written word. Shocking in its visual impact, his series of prints helped lead to regulated housing—a step up from the Lower East Side slum dwellings.

"LODGERS IN A CROWDED BAYARD STREET TENEMENT: FIVE CENTS A SPOT," 1887;  
MUSEUM OF THE CITY OF NEW YORK, JACOB RIIS COLLECTION





### CHARLES AUBRY

*Probing with the camera's lens, Charles Aubry looks inquisitively at the intricate structure of a leaf. The sepia tone of this albumen print was achieved with a low concentration of gold chloride and a mild alkali mixture—a toning technique developed in 1855. The higher the concentration of gold, the bluer the print.*

"A STUDY OF A LEAF (HERACLEUM LONGEFOLIUM)," CA 1864;  
FRAENKEL GALLERY, SAN FRANCISCO

The burgeoning souvenir trade found buyers for anything from individual prints to entire albums; in addition to historic ruins, the public wanted to see the world being transformed by the works of man, and increasing numbers of photographers were commissioned to document new feats of engineering. Andrew Joseph Russell and Alexander Gardner went from the battlefields of the Civil War to the railroads of the American West, documenting construction for the benefit of company engineers.

"The nineteenth century began by believing that what was reasonable was true," one critic observed, "and it wound up by believing that what it saw a photograph of was true." The camera continues to discover, as it did from its earliest days, meanings beyond mere description. Baudelaire castigated photography as "art's most mortal enemy," foreseeing that photography would give the real a firmer grip on our emotions than the ideal. Oscar Wilde apprehended the truer meaning of the craft, though ironically he was commenting on a painting when he wrote: "The true mystery of the world is the visible, not the invisible."

By 1889, when George Eastman was marketing his first Kodak for the amateur market with the irresistible slogan "You press the button, we do the rest," we had become seduced and then obsessed by the visual world. Far from plagiarizing nature, photography has seemed to transform it by revealing the "strangeness of the commonplace" to our still astonished eyes.

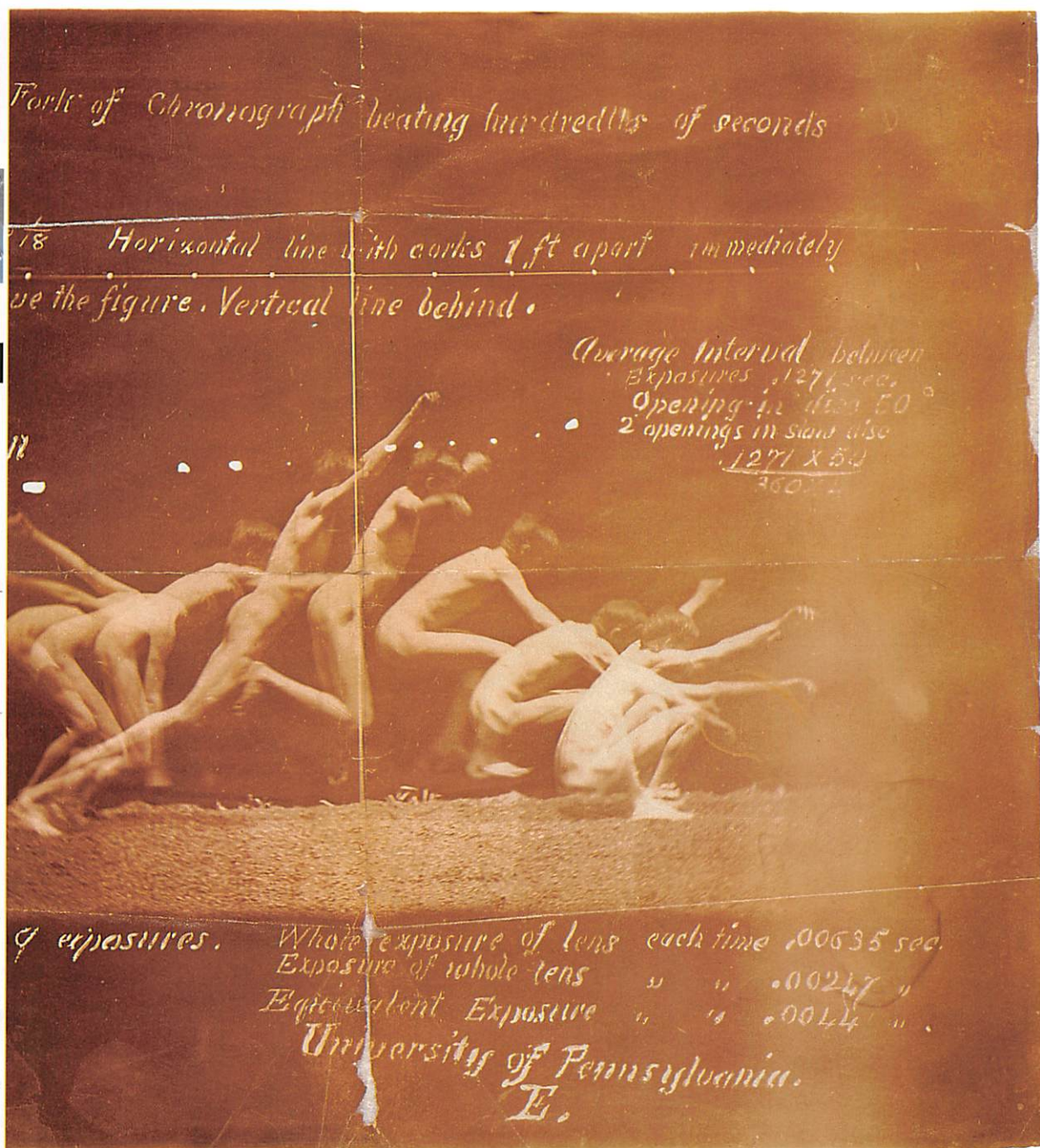




# THOMAS EAKINS

Fascinated with human anatomy, American painter Thomas Eakins captured the fluidity of motion through multiple exposures. The scientific accuracy afforded by this technique was yet another step in the advance of photography.

"NUDE BROAD JUMPING," 1884; THE LIBRARY COMPANY OF PHILADELPHIA



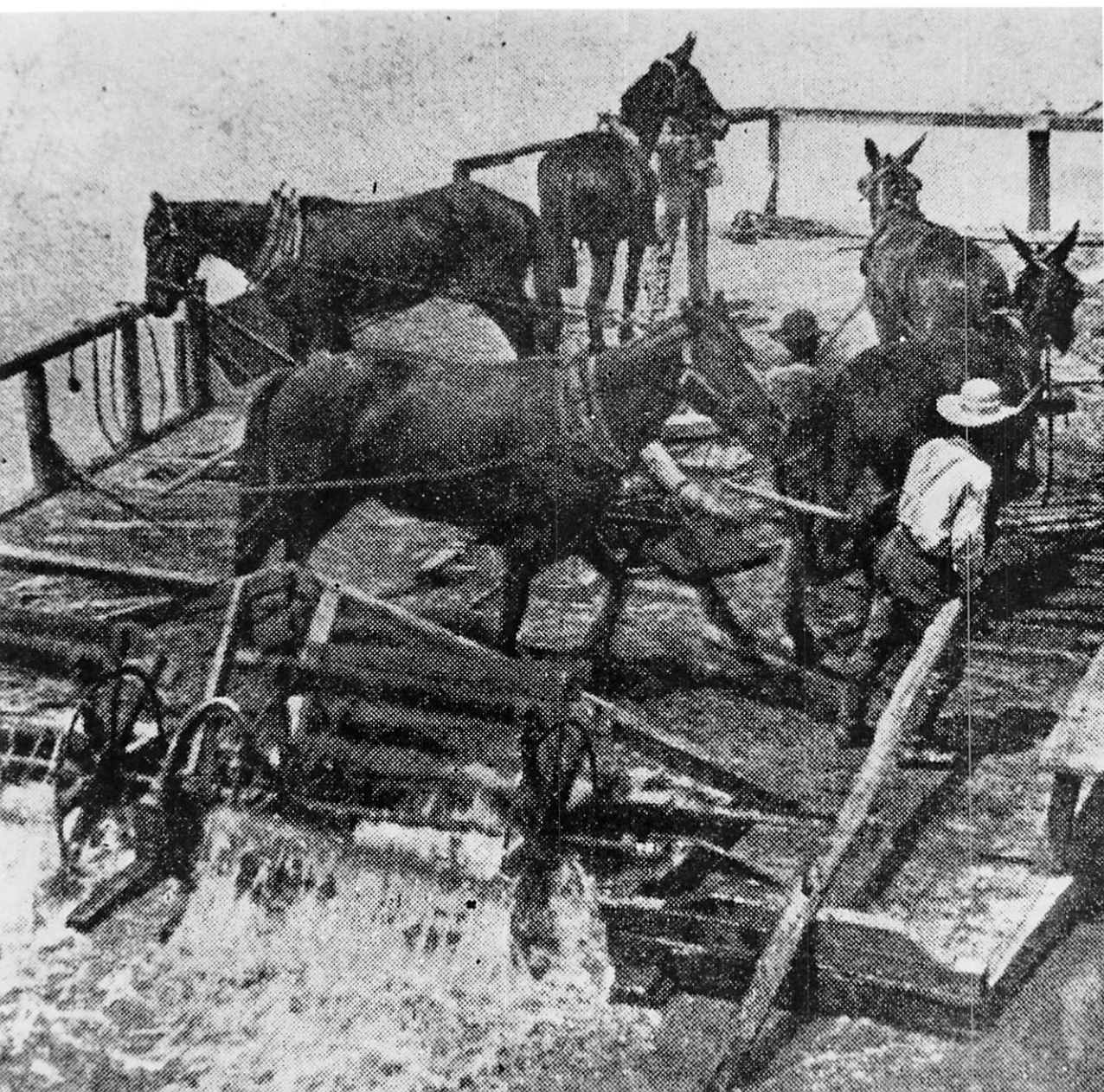
Photographs for this article were taken from a special exhibition, "On the Art of Fixing a Shadow: 150 Years of Photography," which was funded by the Eastman Kodak Company. The exhibition is at the Art Institute of Chicago September 16 to November 26, and will appear at the Los Angeles County Museum of Art December 21, 1989, to February 25, 1990. It opened in May at the National Gallery of Art in Washington, D. C.



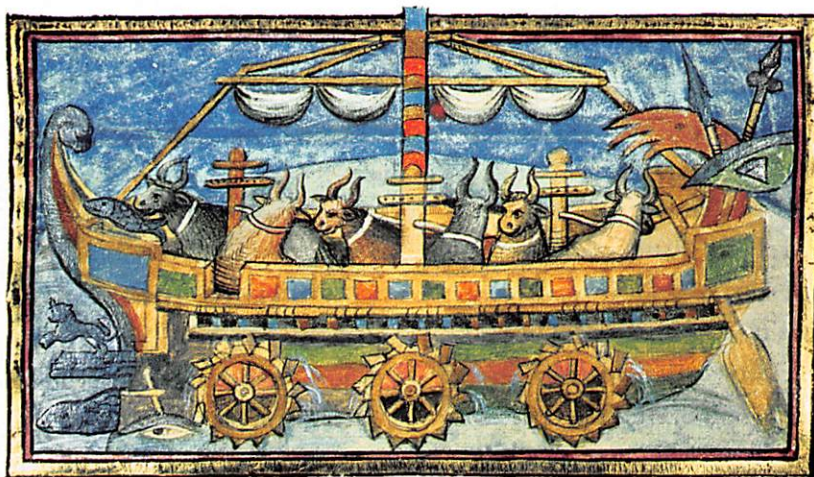
# Heyday of the Horse Ferry

*A long-forgotten animal-powered craft is discovered on the bottom of Lake Champlain.*

By DONALD G. SHOMETTE







BODLEIAN LIBRARY, OXFORD, ENGLAND (ABOVE); THE PUBLIC LIBRARY OF CINCINNATI AND HAMILTON COUNTY, OHIO



**D**RUMMING HOOFS and swirling paddle wheels drive a horse- and mule-powered cargo ferry across the Mississippi River at St. Marys, Missouri, around 1910 (left). Introduced into the United States in the late 1700s, these animal-powered vessels competed for a time with steamboats as successors to sail-powered ships. Known as teamboats, they employed as many as 22 horses or mules at a time, transporting up to 200 passengers and reaching speeds of five knots. The steamboat prevailed, but animal-powered craft continued to operate in the U. S. into the 20th century.

The concept of propulsion by animal power is an ancient one, as seen in a medieval copy of a fourth-century A.D. Roman illustration (above) depicting a battle ram propelled by oxen. They were harnessed to a series of capstans connected by gears to six paddle wheels. The vessel *Liburna*, named for a region along the Adriatic coast, was probably never built. But the idea of paddle-wheel ships powered by animals or humans intrigued later inventors such as Italian engineer Agostino Ramelli, German military designer Konrad Kyeser, and Leonardo da Vinci.

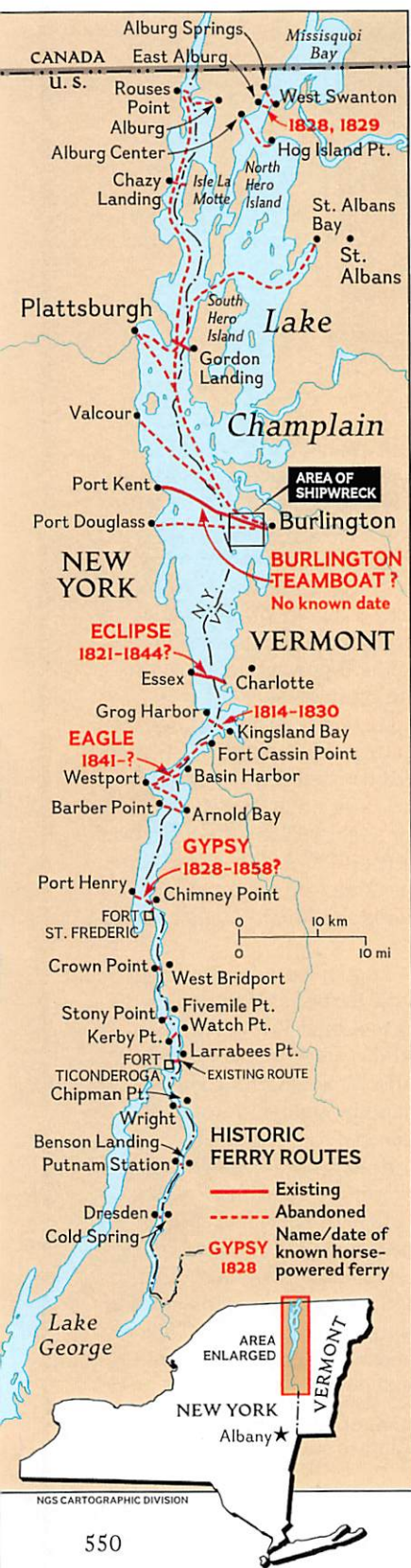
Men, not animals, powered the first known working version of such vessels—a 209-ton ship tested in the harbor of Barcelona, Spain, in 1543. Nearly a century and a half later Prince Rupert of the Rhine had an eight-horsepower paddle-wheel vessel built. In a race against the royal barge of England's King Charles II on the Thames River, Rupert's vessel won handily, though traditional marine designers ignored the innovation.

The first known animal-powered craft in the U. S. was a horse-driven boat built on the Delaware River in 1791 by John Fitch, a pioneer in steam-powered ships. By 1838 teamboats had spread westward to the Mississippi, where they were used primarily as ferries. In the vessel at left two horses and two mules are harnessed to a capstan connected by gears below deck to a pair of paddle wheels at the stern. Such boats inspired a newspaper to exclaim: "Thus in a few years we have witnessed the wonderful improvement from sails to steam, and from steam to animal power."

Marine archaeologist, historian, and author of several books, DONALD G. SHOMETTE is a staff member of the Library of Congress.



# Lake Champlain yields a teamboat



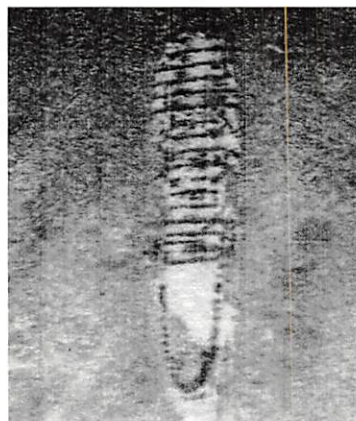
**W**edged between New York and Vermont, the sheltered waters of Lake Champlain (left) were ideally suited to teamboat commerce. In the first half of the 19th century animal-powered ferries, with names like *Eagle*, *Eclipse*, and *Gypsy*, made regularly scheduled runs across the lake. One possible teamboat route, between Burlington and Port Kent, is served today by a modern automobile ferry.

In 1983 researchers Scott Hill and James Kennard surveyed the lake bottom near Burlington by side-scan sonar and discovered the remains of a 19th-century teamboat near the Burlington-Port Kent ferry route. Their survey produced a remarkably detailed sonar image of the wreck (right), showing the outline of the hull and the massive cross timbers.

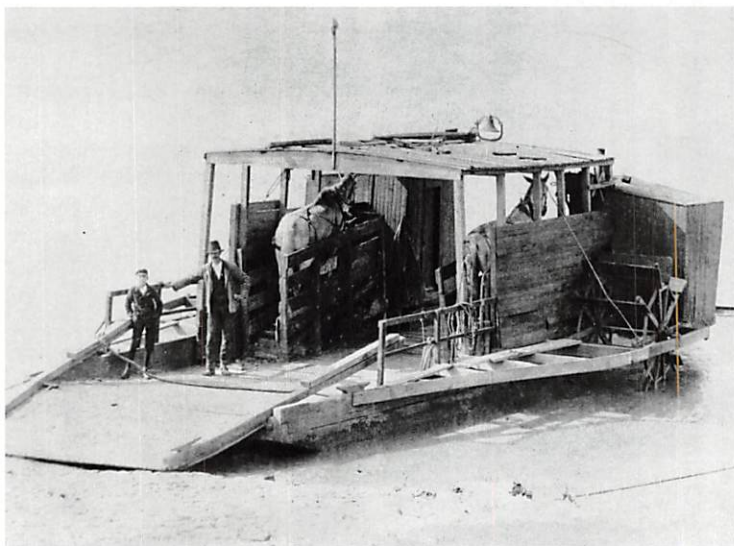
With a permit from Vermont and a small federal grant they began an archaeological survey of the 63-foot-long vessel. Careful inspection revealed that the craft was similar to a class of two-horse teamboat patented



EMORY KRISTOF



JAMES KENNARD AND SCOTT CHAPMAN HILL



THE PUBLIC LIBRARY OF CINCINNATI AND HAMILTON COUNTY (ABOVE); SCOTT CHAPMAN HILL

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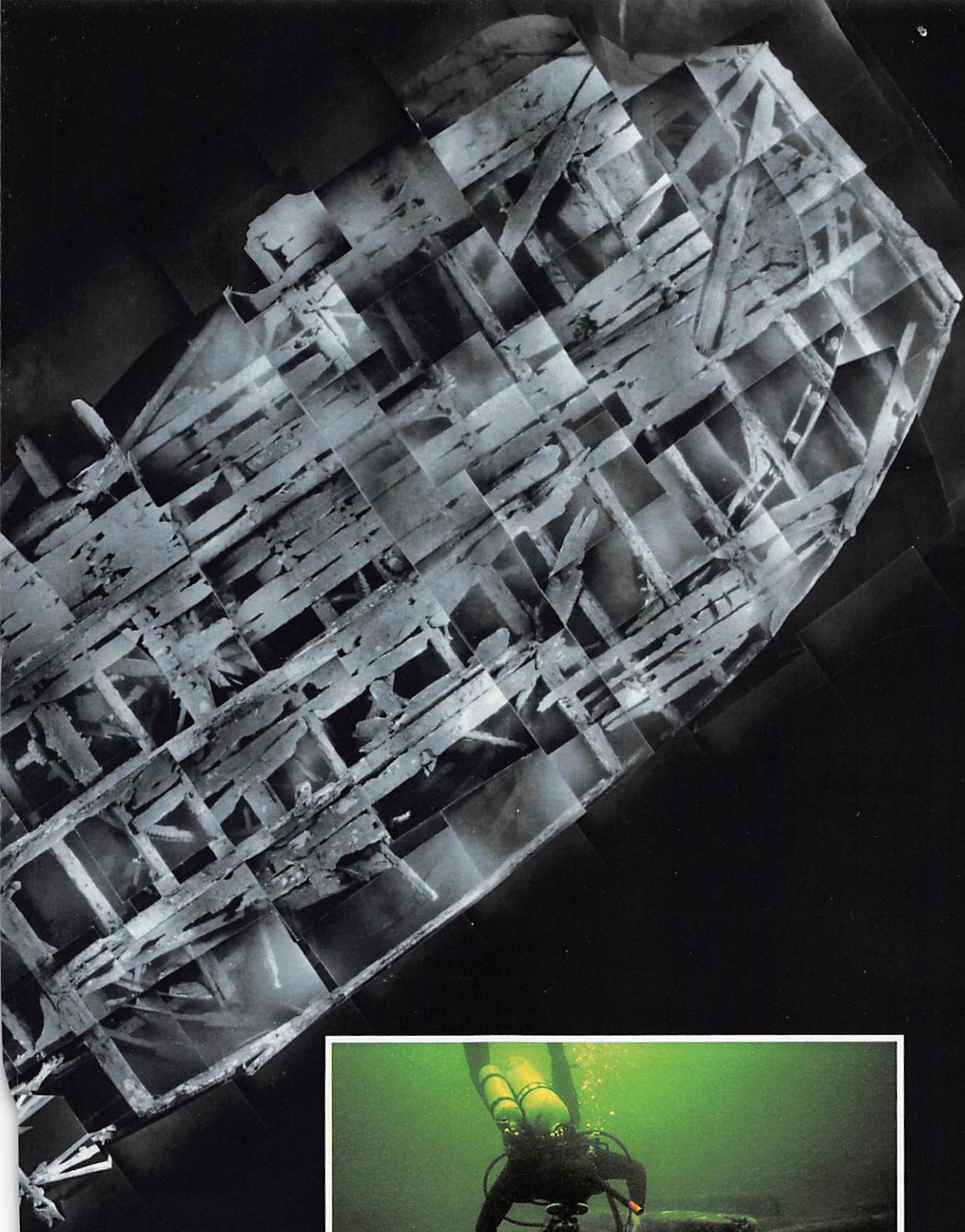


PHOTO MOSAIC BY SCOTT CHAPMAN HILL  
WITH DENNIS R. FLOSS AND MILT SHARES;  
SCOTT CHAPMAN HILL (INSET)



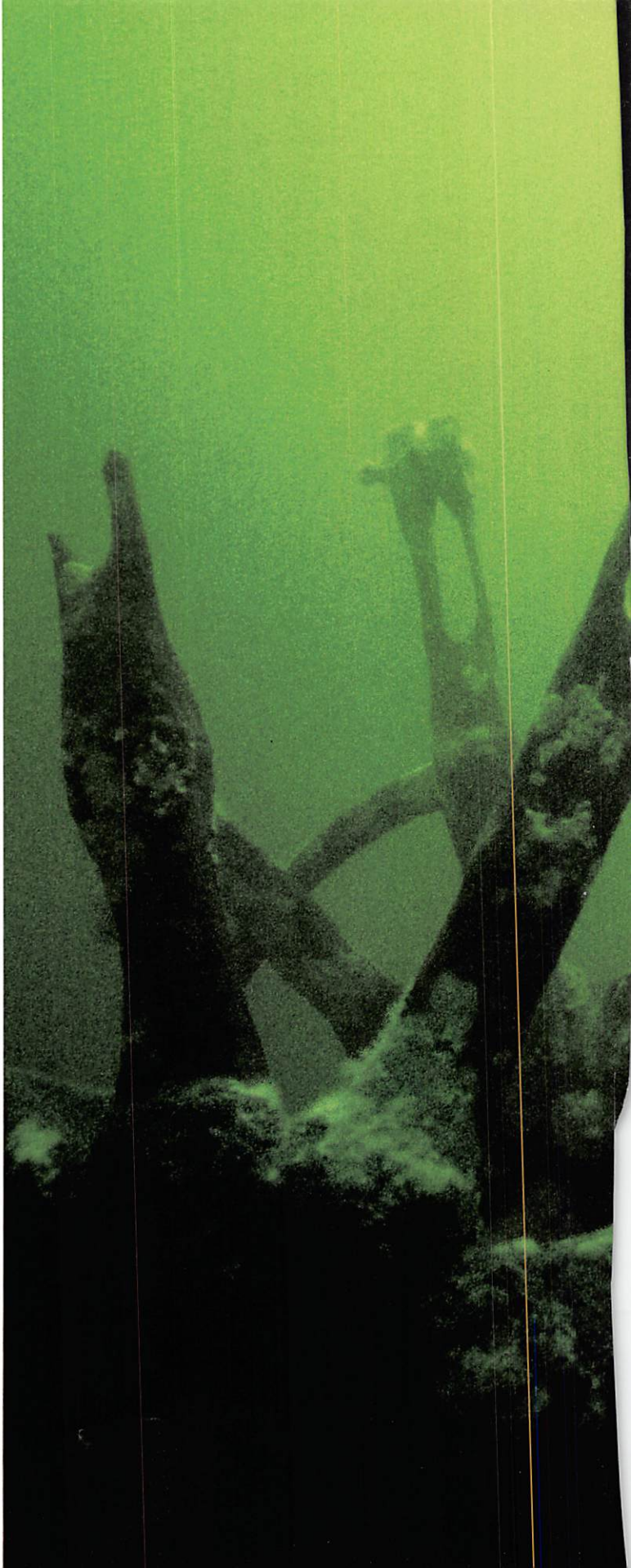
in 1819 by Barnabas and Jonathan Langdon and operated at several points along the Hudson River. Another type of two-horse ferry (bottom left) ran on the Ohio River in the late 19th century.

In the winter of 1988 Scott Hill invited NATIONAL GEOGRAPHIC photographer Emory Kristof and me to conduct an additional survey of the Burlington teamboat through the lake's frozen surface, using sector-scan sonar and a remotely operated underwater vehicle, or ROV.

After cutting an opening through the eight-inch-thick ice, we lowered the ROV to the bottom (top left) and filmed the wreck extensively.

Later I dived on the wreck, whose fragile paddle-wheel spokes are examined by another diver (right). Although the wooden paddles between the spokes were missing, the wreck was well preserved in the lake's cold, fresh water.

My dive provided a possible answer to why the Burlington teamboat sank. Before the dive I had pored over hundreds of photographs and sonar and video recordings of the sunken vessel without finding the cause of the wreck. But once underwater I found a series of cracked frames along the ship's starboard side that had eluded the video lens. The cracks and other damage to the vessel's hull suggest that the ferry may have been trapped and crushed by ice, probably during a late-autumn run. The fact that deck planks had been removed suggests also that salvors had time to retrieve everything of value before the ferry went down.









# Underwater mosaic of a historic craft

To produce a detailed portrait of the Burlington teamboat, Scott Hill enlisted the help of fellow divers and the support of Eric Gilbertson and Giovanna Peebles of Vermont's Division for Historic Preservation and of the Champlain Maritime Society. With a grant from the National Park Service administered by the state of Vermont, Hill and his colleagues built a movable plastic-and-aluminum frame three and a half feet above the lake-bottom wreck. Then they attached an underwater camera with strobe lights to the frame so that the camera could slide back and forth to any point above the site. Inching the camera along, Hill made a total of 550 overlapping photographs in the space of only two days.

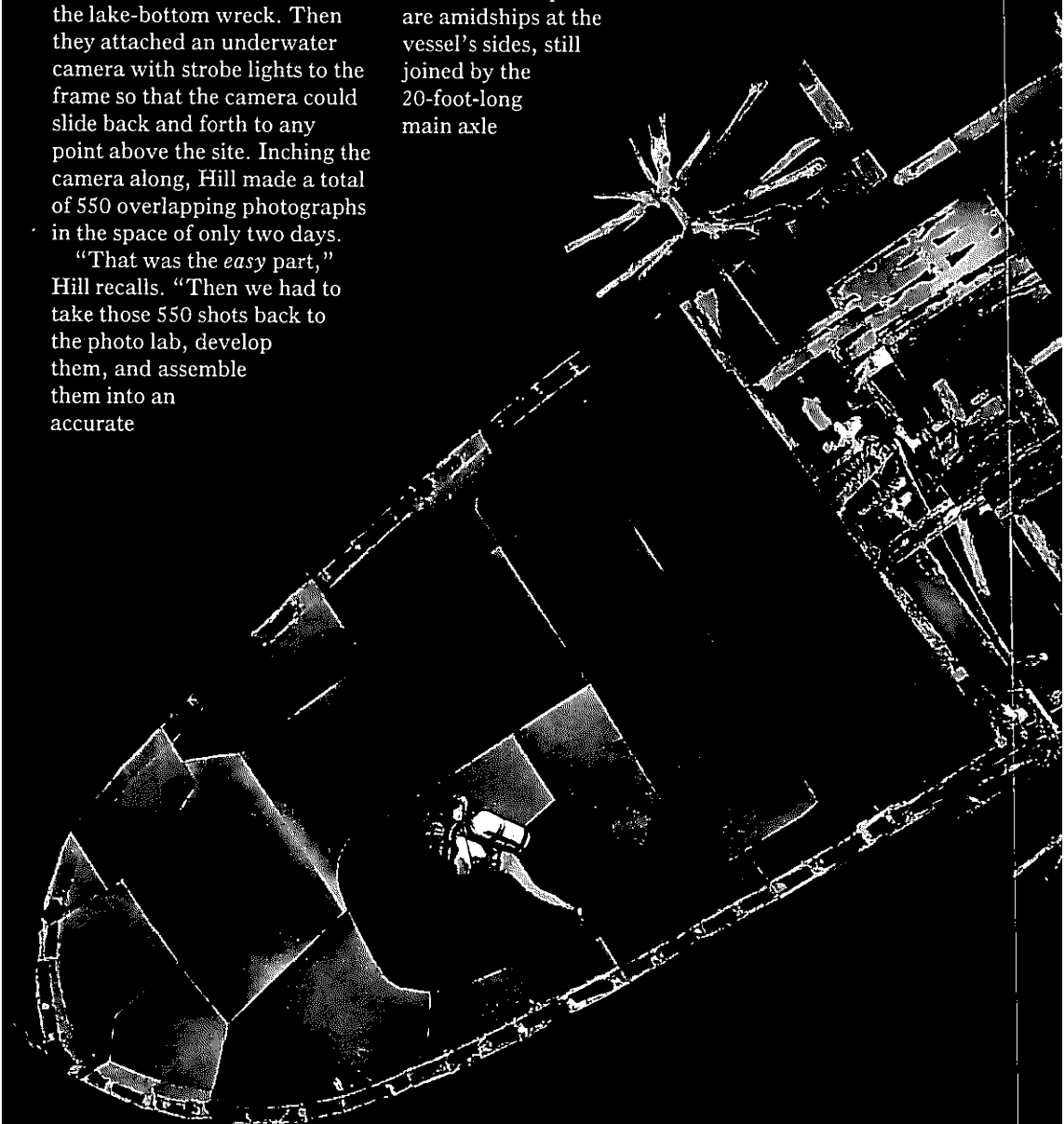
"That was the *easy* part," Hill recalls. "Then we had to take those 550 shots back to the photo lab, develop them, and assemble them into an accurate

rendition of the ship. It was like trying to put together a giant jigsaw puzzle without a picture of the completed scene to go by. It took us more than three months to do the job."

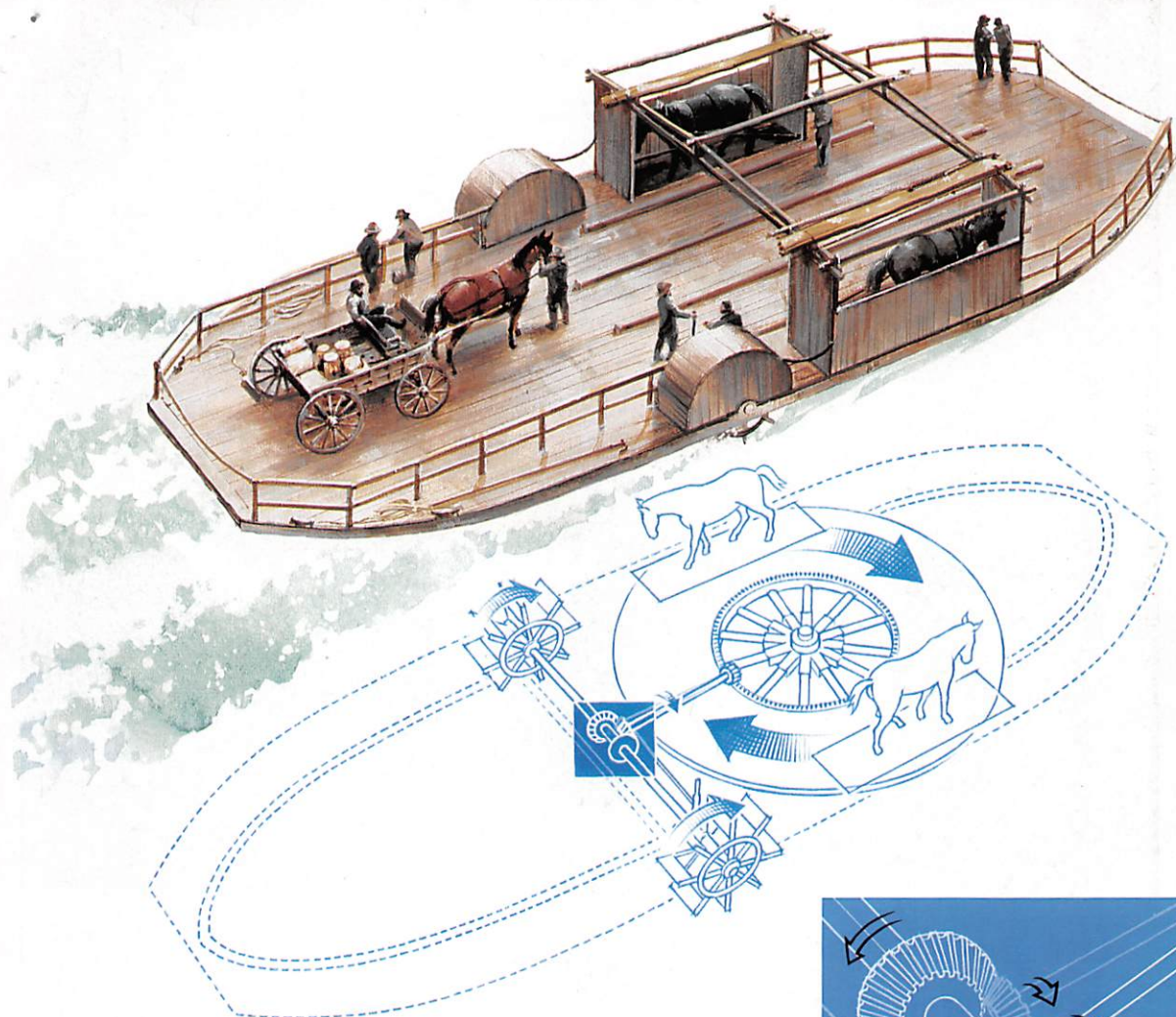
The result of their efforts is a unique portrait of one of the only known teamboat wrecks in the United States.

Like many modern-day ferries the teamboat was double-ended and could navigate in either direction. The remains of the paddle wheels are amidships at the vessel's sides, still joined by the 20-foot-long main axle

and connected by a pair of gear wheels to the drive shaft. Remnants of the huge turntable on which the horses walked appear beneath the deck timbers. For scale, Hill posed divemaster Don Mayland in the vessel's empty section. Douglas Entz (below right) inspects the ferry's twin gear wheels amid a pile of timbers.



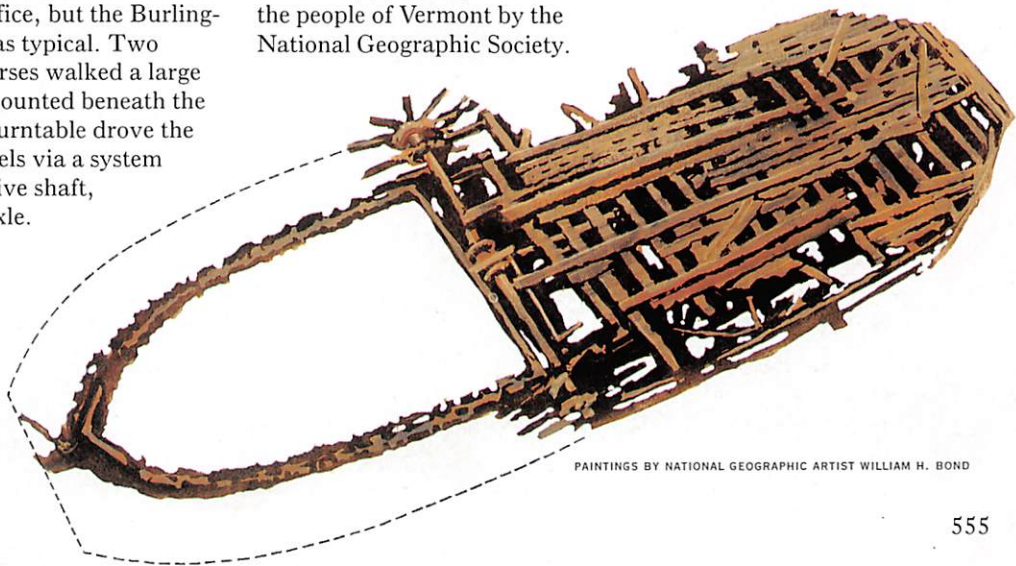
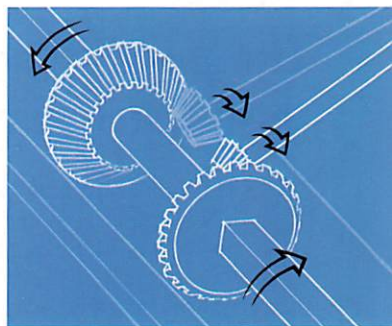




## Inner workings of a teamboat

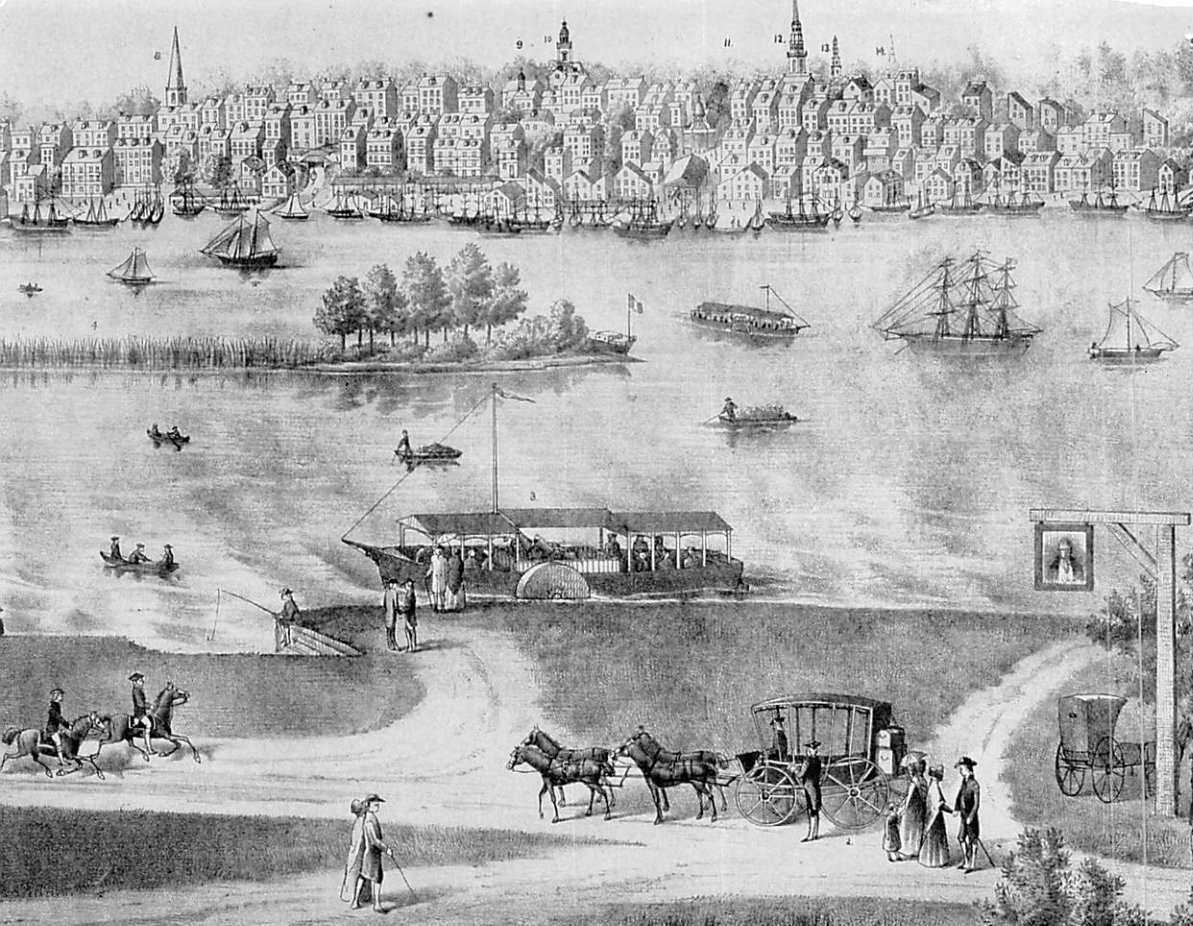
**A**t least 16 designs for teamboats were filed with the U. S. Patent Office, but the Burlington ferry was typical. Two mules or horses walked a large turntable mounted beneath the deck. The turntable drove the paddle wheels via a system of gears, drive shaft, and main axle.

To reverse direction, the pilot pulled a lever shifting the drive shaft from one axle gear wheel to the other (right), reversing the paddle wheels. A scale model of the wreck, carved by Lt. Comdr. Robert Gwalchmai of the Canadian Navy, will be presented to the people of Vermont by the National Geographic Society.



PAINTINGS BY NATIONAL GEOGRAPHIC ARTIST WILLIAM H. BOND





THE MARINERS' MUSEUM, NEWPORT NEWS, VIRGINIA

## The passing of the horse ferry

**T**he height of the teamboat era in the U. S. lasted from 1814 to the middle of the century, by which time steam-powered vessels had literally pulled ahead. By 1840 horse-powered ferries had seen service at Albany, Hartford, New York City, Washington, D. C., and Philadelphia. An 1820 print of Philadelphia shows a 40-foot ferry docked

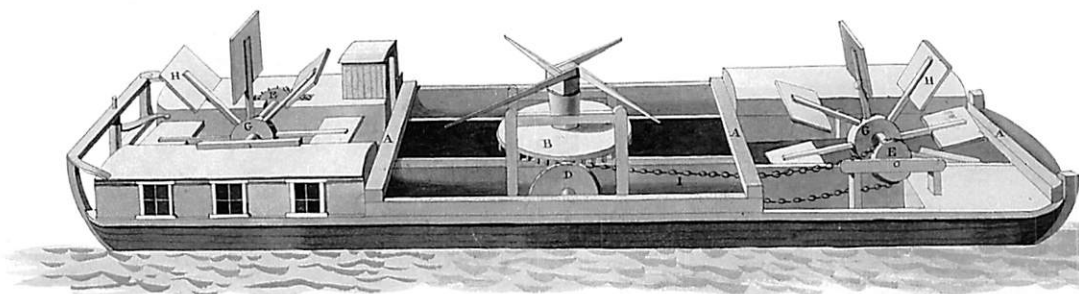
at Cooper Point as a second rounds a spur of land in the Delaware River.

First introduced in America's eastern cities, teamboats moved westward with the settlers to the Ohio country and the Mississippi and Missouri Rivers. By the time of the Civil War the number of animal-powered craft had begun to decline. Few ever appeared in the Far West.

Among the many versions of teamboats was a man-powered catamaran-hulled craft (below) patented by inventor William P. Sprague in 1795 and tested on

the Delaware River. Four men amidships turned the capstan, which was connected by a chain to paddle wheels fore and aft. Like John Fitch's teamboat, Sprague's invention was a mechanical success but a commercial failure.

The last American teamboat—a modest craft powered by a single blind horse—was retired in 1929. It had served only briefly, but it is perhaps fitting that the home port of this humble descendant of the ancient *Liburna* was Rome—Tennessee, that is. □



FROM PROPULSION OF VESSELS, 1791, BY ROBERT FULTON, COURTESY OF U. S. PATENT AND TRADEMARK OFFICE SCIENTIFIC LIBRARY



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OCTOBER 1989

# GEOGRAPHICA

NATIONAL GEOGRAPHIC MAGAZINE

## Herculaneum's Dead Still Tell Tales

Archaeologists continue to uncover the remains of victims buried in the seaside chambers of Herculaneum (NATIONAL GEOGRAPHIC, May 1984), destroyed in the same eruption of Mount Vesuvius that buried its sister city of Pompeii in A.D. 79. The excavations are yielding buried treasure as well.

Since 1986 crews digging in the chambers that once stood at the edge of the Bay of Naples have found more than 80 skeletons (right), many huddled together in mute testimony to the suddenness of the eruption and the havoc it wrought. They included a mother sheltering her child and, in a chamber nearby, a youth with a dog.

One room also held one of the richest finds yet uncovered from the chambers. Amid the rubble were a gold brooch with the image of Helios, the sun god (below), gold earrings, rings,



O. LOUIS MAZZANTENA, NGS STAFF

two snake-head bracelets, silver vases, the imprint of a wicker basket, and the bronze and silver coins it once held. There was also a glass bottle containing the residue of a dozen aromatic substances that may have been used as an ointment.

Meanwhile a study of 139 skeletons uncovered earlier produced a surprise: Sara Bisel—a physical anthropologist sent by the National Geographic Society at the request of Italian authorities to preserve the remains—says the skeletons reveal that the average age of the people in the chambers was older



O. LOUIS MAZZANTENA, NGS STAFF

than expected. This suggests that many children and young people may have been able to escape the destruction. But Dr. Bisel cautions that the "missing" youths may be found in chambers not yet excavated.

## Tidying the "World's Highest Trash Pit"

Liz Nichol and Bob McConnell went to Mount Everest in 1987 as part of an expedition that came within a thousand feet of the summit via a North Face route. They will return next summer—not to climb up, but to clean up.

Filled with shame that mountaineers have created the "world's highest trash pit," Nichol and McConnell will lead a month-long expedition to the advance base camp, at 18,500 feet, on the Tibetan side of Everest. They will gather trash that has been left by climbers, burn what can be burned on the world's highest mountain, and separate the rest to be carried out and buried or recycled.

The Everest Environmental Expedition, based in Colorado Springs, Colorado, hopes to enlist the cooperation of Tibetans in properly disposing of trash and preserving the area's beauty. It also will work to remind climbers worldwide to carry out their trash and waste. The effort has the support of the American Alpine Club, the Explorers Club, and the American Mountain Foundation.

## It's a Twig, a Catkin . . . No! It's a Caterpillar!

Imitation is the sincerest form of flattery, even for a caterpillar.

*Nemoria arizonaria*, a kind of inchworm found on oak trees in the southwestern United States and Mexico, produces two broods a year. When the first brood hatches in the spring, the oaks are covered with fuzzy, spiky flowers called catkins. The caterpillars eat these flowers and end up looking like the catkins (below). A few months later a second brood hatches. By this time the catkins are gone, and the new brood of caterpillars eat leaves. Instead of resembling catkins, the summer brood ends up looking like oak twigs.

Erick Greene of the University of California, Davis, who discovered this "developmental novelty," has found that the form the caterpillar takes is determined by what it eats. "I can take eggs from either brood and turn them into the catkin or the twig form after they hatch, depending on what I feed them," he says. Catkins are more nutritious, but they are available as a food bonanza only for a month or so.



ERICK GREENE

The mimicry probably provides caterpillars with visual cover from birds flying around in search of food. Greene says. That may explain why if you put a catkin mimic on a catkin, it remains still; but if you put it on a leaf, it heads for the nearest catkin.